RUSS DEATON
*Interim Executive Director*

STATE OF TENNESSEE
**HIGHER EDUCATION COMMISSION**
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BILL HASLAM
*Governor*

TO: David Gregory
Acting Chancellor, Tennessee Board of Regents

FROM: Russ Deaton RD

SUBJECT: Middle Tennessee State University
Letter of Application to Plan Fermentation Science BS Program

DATE: June 14, 2016

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In accordance with THEC policies, colleges and universities are required to submit Letters of Application for authorization to proceed with developing proposals for new academic programs and units. The THEC financial projection form for the proposed program must accompany the letter of application to plan. Upon THEC approval to proceed with developing proposals, institutions should do so in a manner consistent with THEC policies and criteria.

Programs must document relevance to institution's mission, provide enrollment, graduation and financial projections, describe the anticipated evaluation process, document employer and student demand, and certify that the proposed program will not unnecessary duplicate existing offerings at other Tennessee public institutions. The proposal must ensure faculty sufficiency, existence of student support resources, and adequacy of library, space, equipment, and technology.

I approve Middle Tennessee State University to plan the Bachelor of Science in Fermentation Science. It is understood that the proposed program will be in accord with the mission at MTSU, will meet the *THEC 2015-25 Master Plan for Tennessee Postsecondary Education* degree completion and workforce development objectives, and will be implemented with existing funds.

The Letter of Intent projects implementation of an approved Fermentation Science BS program in August 2017. Please be advised that the Letter of Application itself will be posted on the THEC website for public disclosure.

cc: Dr. Tristan Denley, TBR
Dr. Sidney McPhee, MTSU
Dr. Mark Byrnes, MTSU
Betty Dandridge Johnson, THEC

# TENNESSEE BOARD OF REGENTS

**Academic Proposal Form for All New Programs**

## COVER PAGE

***This form is submitted with all proposals requiring Board approval to the TBR Vice Chancellor for Academic Affairs. The COVER PAGE may be submitted as a PDF. All other forms should be submitted as MSWord documents.***

***Please remember to submit only one proposal with related support documents per e-mail.***

**Sponsoring Institution(s):** Middle Tennessee State University

**Proposal Statement:** Establish a Bachelor of Science degree in Fermentation Science

**Degree Designation [or] Type of Certificate:**

B.S. (Formal Degree Abbreviation) in Fermentation Science (Title of Proposed Program to be established or impacted)

**Proposed Degree [or] Certificate CIP & SOC Codes:** 01.1099.00 / 51-9012

**Concentrations:** (if applicable) N/A

**Proposed CIP & SOC Codes:** N/A

**Anticipated Delivery Site(s):** MTSU Campus - Murfreesboro

**Proposed Implementation Date:** Fall 2017

**Cooperative/Collaborative Partners:** N/A

For more information contact: Peter H. Cunningham (Name) / 615-494-7611 (Telephone)

**Institutional Approval:** _____ / 11/16

***Signature of President (required)*** ***Date***

*The Cover Page documents the President's support and that the proposal has been reviewed and approved through the established institutional processes. Collaborative programs require the President's signature from **all** participating institutions.*

**Letter of Application for All New Degrees Programs with/without Concentrations, Certificates, Duplications of Existing Community College Programs, Collaborative/Joint Programs**

***Refer to TBR Policy 2:01:01:00, TBR Guideline A-010, and THEC Policy A1:0 and A1:1 before developing a Letter of Application.***

**INSTRUCTIONS: Please respond to each question. If the question is not applicable, please use "NA" and include a brief explanation of why the question is not applicable to the proposed action. The form will expand to allow space as needed and must be submitted to the TBR Vice Chancellor for Academic Affairs and the Vice Chancellor for Community Colleges as designated in A-010.**

**SECTION I. INTRODUCTION**

**DATE OF SUBMISSION:** April 21, 2016

**INSTITUTION(S):** Middle Tennessee State University

**TITLE OF PROGRAM:** Bachelor of Science in Fermentation Science

**CIP and SOC CODES:** 01.1099 / 51-9012

**CONCENTRATIONS:** No Concentrations
**CIP and SOC CODES:**

**PROJECTED DATE FOR SUBMISSION OF IMPLEMENTATION PORTFOLIO:**

September 2016

**TARGET DATE FOR BOARD APPROVAL:** December 2016

**PROPOSED DATE OF PROGRAM IMPLEMENTATION:** Fall 2017

**A. PURPOSE**

Campus-specific purpose:
The MTSU mission states that "the university is committed to preparing students to thrive in their chosen professions and a changing global society." The proposed B.S. in Fermentation Science is a direct reflection of that "changing global society", especially as

exhibited in the United States and Tennessee, specifically. Fermented foods have been and continue to be staple commodities in almost every society, but our understanding of the nutritional and long-term health value of fermented foods is now being translated into increasing demand for custom and specialized fermented foods. Fermentation is now understood to be an ideal vehicle for the production of highly nutritious and long-term stable foods with unique flavors, textures and aromas. Tennessee is home to a large and diverse community of food processors; the most significant growth over the last 10 – 15 years has been in the fermented foods segment of this vitally important industry. Fermented food manufacturers of every type need college graduates with specialized training who can enter the workforce ready to sustain and advance the industry.

Further, this proposed program achieves many of the purposes listed as part of the mission of the College of Basic and Applied Sciences (CBAS) and the School of Agribusiness and Agriscience (ABAS):

- CBAS Mission: Provide "hands-on" experience with state-of-the-art materials and equipment.
  The School of Agribusiness and Agriscience incorporates hands-on teaching and learning opportunities into almost every course offered. Industry advisors, in the form of the ABAS advisory board, have repeatedly reiterated the value of the hands-on education practices employed by MTSU ABAS. Students will have the opportunity to learn with, practice on and apply their skills with the latest technologies, to the greatest extent possible.
- ABAS Mission:
  The School of Agribusiness and Agriscience is committed to the general university objectives of teaching, public service and research. The major objective is to maintain and improve the quality of instruction. Public service and research activities are encouraged to promote professional development, to enhance the instructional program, and to better serve the agricultural needs of the region.

Regional purpose:
Graduates with a B.S. in Fermentation Science will work in a variety of positions for major manufacturers in the middle Tennessee area, such as General Mills (Yoplait), Kroger (Dairy Division), Brown-Forman (Jack Daniels), and Diageo (George Dickel), as well as an ever increasing number of new and growing locally owned and operated fermented food producers such as the 28 other distilleries operating across Tennessee, 18 breweries (52 across Tennessee), 22 wineries (60 across Tennessee), 5 cheese making operations (10 across Tennessee), and the 1 additional yogurt manufacturing company operating across Tennessee today. Around the world many different types of food items are routinely fermented at home but in the United States, home fermentation has become a "lost art." There is renewed interest in home food fermentation but the greater expression of the level of interest in fermented foods in general in the US is the increasing demand for these products. According to published reports, 53% of US consumers are seeking bolder flavor in their foods, and that demand is being met by

fermented foods.[1,2] Demand for familiar fermented food products such as pickles, sourdough bread, yogurt, sour cream and sauerkraut is exceeded by demand for traditionally fermented food products native to countries other than the US such as kefir, miso, soy sauce, and pickled fruits and vegetables of all types ranging from beets to peppers.[3] Of particular interest is the capability to produce probiotic compounds in our foods through fermentation.[4] As the American public learns more about the connections between diet and health, demand for trained personnel to work in both agricultural extension and food manufacturing positions with specific knowledge of food fermentation will only increase. Immigration to Tennessee from countries in which fermented foods are staple products is also increasing demand for such products. Opportunities for employment extend well beyond the borders of Tennessee because of the worldwide nature of food fermentation.

State-wide purpose:
The Tennessee Board of Regents' (TBR) strategic plan – "Charting the Course: The Tennessee Board of Regents Strategic Plan, 2010-2015" – includes at its beginning the statement, "It is more imperative than ever that Tennesseans have an opportunity to increase their level of education in order to bring about a better quality of life and also to build greater economic prosperity for the state." (p.2). The proposed B.S. in Fermentation Science will help new students and working adults increase their educational level and quality of life while simultaneously building the state's economic prosperity by providing a better educated and trained work force.

The proposed B.S. in Fermentation Science will also contribute to all four key areas of the TBR strategic plan:

- Access: MTSU's School of Agribusiness and Agriscience has a long-standing relationship with Tennessee's Department of Agriculture as well as the state's food industry, particularly the food processing industry. Courses in Fermentation Science will be taught in partnership with local industry, and hands-on training sessions at industry sites as well as internships with industry will be scheduled to accommodate working professionals as well as traditional students. In addition, articulation agreements between MTSU and MSCC, VSCC, and CSCC will allow students graduating from these community colleges with an Associate's of Applied Science

[1] "Fermented Artisanal Foods Rising in Popularity", Judie Bizzozero, Natural Products Insider, http://www.naturalproductsinsider.com/blogs/trending-foods/2014/08/fermented-artisanal-foods-rising-in-popularity.aspx, extracted from the web 1/3/16.
[2] "Consumer Demand for Bolder Flavors Ups Sales of Fermented Foods", Rachel Zemser, New Hope 360, http://www.naturalproductsinsider.com/articles/2012/07/fermentation-an-old-process-made-new.aspx, extracted from the web 1/3/16.
[3] "Fermentation-An Old Process Made New", Rachel Zemser, Natural Products Insider, http://www.naturalproductsinsider.com/articles/2012/07/fermentation-an-old-process-made-new.aspx, extracted from the web 1/3/16.
[4] "Fermented Foods—Are They The Next Big Nutrition Trend?", Lindsey Getz, Today's Dietician V. 14, N. 7, pp 52, http://www.todaysdietitian.com/newarchives/070112p32.shtml, extracted from the web 1/3/16.

degree to attend MTSU and pursue a Bachelor of Fermentation Science degree without additional prerequisites for admission to junior and senior level courses. Attachment C - Curriculum outlines a pathway for students earning an Associate of Science degree from any Tennessee community college to matriculate into the MTSU B.S. in Fermentation Science degree program. Students transferring into the MTSU Fermentation Science program with an A.S. degree can complete the B.S. degree with no extra course requirements by following the curriculum suggested in Attachment C.

- Student Success: As documented above, the B.S. in Fermentation Science will help foster "the growth of existing businesses and to attract new high paying industries to the state." (pp.9-10) As noted in the Mission section of this document, adult students returning to college bring maturity and experience that enhances their ability to graduate successfully, and it is highly likely that many of these adult learners will have already gained experience working in the targeted industries. The interaction of these older learners with younger students in the program will have a significantly positive synergistic effect on the entire program.
- Quality: The B.S. in Fermentation Science will address both the current, pressing needs of local industry as well as create new opportunities for industry as we develop a corps of highly trained food industry specialists who will have the capability to rapidly and seamlessly transition from one type of fermented food industry to another.
- Resourcefulness and Efficiency: The Fermentation Science program requires extensive hands-on training as well as a significant internship with a commercial operation. By utilizing local, national and international industrial facilities, at no cost to Tennessee, this part of the TBR strategic plan is fulfilled. Since Fermentation Science is a specialized subset of the Agricultural degree programs already offered at MTSU, the current curriculum requires little more than the addition of specialized courses and two new faculty positions.

National and international purpose:

The need for graduates trained in fermentation science is driven by three facts: survival is a function of food availability, food preservation is essential to ensuring that food is available year-round, and food fermentation is the only food preservation technique that does not require the input of energy to accomplish. As the world population approaches 7.5 billion and competing demand for the use of land for food production versus energy production, transportation, living, and recreation drives us to seek ways to feed ourselves with minimal energy input, food fermentation will be an essential and critical tool in ensuring our collective survival.

Fermentation Science lends itself to both energy and food production. Ethanol production from organic matter (e.g. corn, switchgrass, and other plant materials), as is currently practiced worldwide, is an example of non-food applications of fermentation science and an indication of the inherent flexibility of this degree. Employment opportunities for graduates of this degree program are not limited to the State of Tennessee or the United States. Ethanol and fermented foods of numerous types are

produced worldwide, and we believe that the establishment of this degree program will attract both students and employment offers from around the world.

Population:
The proposed program will allow students entry points as entering freshmen and as transfers into the junior year from community colleges. Non-traditional students as well as students who work full-time and with the military will be encouraged to apply. Evening classes will be developed to accommodate the schedules of students as demand is indicated.

Academic purpose, workforce development, and/or research needs:
Agriculture as practiced in the US has advanced significantly since the so-called "Green Revolution", and the preparation of graduates to work in this career field has similarly changed and advanced. The efficient production of food and fiber, which has been a key objective of agriculture for the last 60 years, is not sufficient to meet the demands of the growing world population. Agriculture must now focus on ways to ensure that the food and fiber produced efficiently on the farm is preserved to the greatest extent possible and meets the flavor, textural and cultural demands of the consuming public. The development of an academic program in Fermentation Science will allow the MTSU ABAS to capitalize on existing partnerships with middle Tennessee food processors and establish new relationships with companies that previously had not recognized the ability of MTSU to meet their employment demands. Since hands-on training is central to the ABAS program, it will naturally enhance interactions with and opportunities for faculty and students with local industry. The faculty and students will be regularly involved in training sessions at manufacturing locations involved in fermentation of all types. This will result in increased interaction and communication between MTSU and these organizations, leading to more internships, co-ops, and faculty consultations as well as increased opportunities for applied research.

## B. INSTITUTIONAL PRIORITY

In 1995 Tennessee hosted 15 wineries, 2 distilleries, 2 major cheese-making facilities and no other fermentation facilities of any type. Today Tennessee hosts 60 wineries, 30 distilleries, 52 breweries, 10 cheese making operations, the largest yogurt manufacturing plant in the world (in addition to additional smaller yogurt producers) and a 110 and a 120 million gallon/year ethanol production facility (in Loudon and Obion Counties, respectively). Fermentation for food and energy production in Tennessee is growing rapidly and none of the private or state institutions of higher education in Tennessee have directed any attention to training Tennesseans to work in the industry. Within agriculture, fermentation science is one of the two fastest growing areas of interest with the most immediate impact on the well being of humanity. The proximity of so many of these facilities to MTSU and the potential for further growth of industries utilizing fermentation science demand MTSU seriously consider the development of this academic program.

## C. NEED:

Since Fermentation Science is generally classified as a sub-discipline within Agriculture, such tools for analysis as the THEC supply/demand analysis have not been developed. Also, the U.S. Bureau of Labor Statistics does not list Fermentation Science as a specific entry. However, there is growing recognition that Fermentation Science is an important avenue to education and employment at both the community college and four year university levels.[5,6] The State of Colorado (through the Colorado Commission on Higher Education) has established articulation agreements that pave the way for Colorado community colleges to offer two-year degrees in agricultural education and Fermentation Science that are immediately transferrable to Colorado State University.[7] A search for jobs using the keyword "Fermentation" on the website, Indeed.com resulted in 538 positions (1/7/16) across the country, indicating substantial demand for this line of education. Perhaps most indicative of the demand for four-year degrees in brewing and Fermentation Science is the Master Brewers Association of the Americas (MBAA) 2014 Higher Education Survey.[8] This analysis states, "Applicants with four-year degrees in brewing and fermentation science were highly valued by the majority of brewer members (60%)" and "Respondents were asked what jobs in their company would require a four-year degree. Most (55%) preferred a four-year degree for management and leadership positions, with about a third of those specifically requiring a four-year degree for brewmasters or head brewers. Other positions where a four-year degree was preferred included quality positions (24%), brewery positions (26%), lab technicians (17%), and engineers (14%)."[9]

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[5] "The Art, Science and Job Prospects of Brewing Beer", Tabitha Whissenmore, Community College Daily, Feb 8, 2013, American Association of Community Colleges, http://www.ccdaily.com/Pages/Workforce-Development/In-NC-a-new-program-is-brewing-to-serve-local-industry.aspx, extracted from the web 1/7/15.

[6] "A Degree in Beer, Wine and Kombucha", Kenneth Rosen, The Atlantic, Jan 15, 2014, http://www.theatlantic.com/education/archive/2014/01/a-degree-in-beer-wine-and-kombucha/283093/, extracted from the web 1/7/15.

[7] "Recommend Approval of Statewide Transfer Articulation Agreements and Associate of Science Degrees with Academic Designation in Agricultural Education and Fermentation Sciences for Aims Community College and Colorado Community College System", Colorado Commission on Higher Education, Sep 3, 2015, https://highered.colorado.gov/CCHE/Meetings/2015/sep/sep15_iid.pdf, extracted from the web 1/7/15.

[8] Analysis of the 2014 Higher Education Survey, Master Brewers Association of the Americas, http://www.mbaa.com/education/Documents/Report%20on%202014%20Higher%20Education%20Survey.pdf, extracted from the web 1/7/15.

[9] Ibid.

## D. IMPACT:

We anticipate that this program, with its unique and highly flexible employment potential in combination with a rapidly growing fermentation industry in Tennessee and nationwide, will draw student interest from within and beyond MTSU as well as the State of Tennessee. The built-in capability for students to transfer into the program from Tennessee's community colleges will further generate student interest and enrollment. Additionally, we anticipate that the synergy between the MTSU School of Agribusiness and Agriscience and local industry will be expanded through this program and will continue to provide a beneficial relationship for both parties that will continue to benefit the local, regional and national communities.

## E. DIVERSITY STATEMENT:

Persons of color and students from other minority groups are underrepresented in the STEM fields, including agriculture. Since the proposed MTSU Fermentation Science program promotes articulation from MSCC and other Tennessee community colleges, this will provide an additional path for underserved populations, who often initially access higher education at the community-college level, to obtain the bachelor's-level credential through the MTSU program.

## F. PLANS FOR ACCREDITATION:

(Identify the source and **projected date** of Professional accreditation if applicable; if the proposed program requires a SACSCOC Substantive Change Review and, if so, describe the scope of the substantive change. Information on actions constituting substantive change can be found at the following website: http://www.sacscoc.org/substantivechange.asp . If there are no plans to seek specialized accreditation, please provide reasons.)

MTSU is a comprehensive university authorized to grant bachelors, masters, and doctoral degrees. A SACS Substantive Change Review is not required for the B.S. in Fermentation Science.

There is not an accrediting body for fermentation science programs. We will internally assess program quality on the basis of stated learning outcomes and employment of graduates of the program and incorporate this data into our 5-year program review for performance funding purposes.

## G. IDENTIFY ANY LOW PRODUCING PROGRAMS AT YOUR INSTITUTION(S) BASED ON THEC ANNUAL PROGRAM PRODUCTIVITY REPORT(S):

- B.S. in Environmental Science & Technology (substantive revision in 2015)
- B.A. in Art History (substantive revision in 2016)
- B.S. in Athletic Training
- B.S. in Forensic Science
- M.S.T. in Mathematics
- Ph.D. in Public History

**H. LIST ALL NEWLY APPROVED AND ESTABLISHED PROGRAMS INCLUDING CERTIFICATES OFFERED THROUGH ANY PUBLIC INSTITUTION IN TENNESSEE INCLUDING THE TENNESSEE COLLEGES OF TECHNOLOGY AT THE SAME LEVEL (WITHIN THE SAME OR SIMILAR CIP [HTTP://NCES.ED.GOV/IPEDS/CIPCODE/SEARCHRESULTS.ASPX?Y=55&CA=2] AND SOC CLASSIFICATIONS [HTTP://WWW.BLS.GOV/OES/CURRENT/OES_STRU.HTM]). A CIP TO SOC AND SOC TO CIP CROSSWALK IS AVAILABLE AT HTTP://NCES.ED.GOV/IPEDS/CIPCODE/RESOURCES.ASPX?Y=55. THE THEC WEB-BASED INVENTORY AND PROGRAM PRODUCTIVITY ANALYSIS FOR STATE INSTITUTIONS ARE AVAILABLE AT: HTTP://TENNESSEE.GOV/THEC/DIVISIONS/ACADEMICAFFAIRS/AA_MAIN.HTML.**

No Tennessee institutions have newly approved or established programs in CIP 01.1099.

**I. IDENTIFY ANY LOW PRODUCING PROGRAMS IN THE SAME OR SIMILAR CIP/SOC CODES IN ANY PUBLIC INSTITUTION IN TENNESSEE BASED ON THE CURRENT THEC LISTING OF PROGRAMS FAILING TO MEET ENROLLMENT OR GRADUATION BENCHMARKS AS POSTED ON THE THEC WEBSITE BASED ON THEC ANNUAL PROGRAM PRODUCTIVITY REPORT(S) AT THE TIME OF SUBMISSION OF THE LETTER OF APPLICATION:**

No programs currently exist so there are no low-producing programs.

## SECTION II: ARTICULATIONS, COLLABORATIONS AND DUPLICATIONS INCLUDING INTERDISCIPLINARY PROPOSALS

A. If a similar program to the one proposed already exists at other institution(s) in the state, describe any opportunities for collaboration with other institutions that have been or will be pursued.

No similar programs exist at other institutions.

## SECTION III: PROGRAM STRUCTURE

A. Residency requirements (in keeping with SACSCOC requirements):

This major will meet all residency requirements of MTSU and SACSCOC.

B. Macromajors or Academic Foci:

| ACADEMIC FOCI | Check all applicable |
|---|---|
| Arts | |
| Business | |
| Education | |
| Health Sciences | |
| Humanities | |
| Social Sciences | |
| STEM | ✠ |
| Applied Science and Technology | ✠ |
| General Education | |

C. **CURRICULUM:** The proposed program requires completion of 120 Semester Credit Hours (SCH) distributed as follows (IF more than 120 SCH Provide justification per THEC 1.0.60A):

1. General Education (Undergraduate only): **41 Credits**

| Rubric/Number | Course Title | SCH |
|---|---|---|
| Communication | | 9 |
| History | | 6 |
| Humanities & Fine Arts | | 9 |
| Mathematics | | 3 |
| *MATH 1730 | Pre-calculus (4 hrs) | |
| Natural Sciences | | 8 |
| *BIOL 1110/1011 | General Biology I & Lab | |
| *CHEM 1110/1111 | General Chemistry I & Lab | |
| Social & Behavioral Sciences | | 6 |

* To be listed on the back side of the upper division form as recommended general studies courses in these areas.

2. Major Field Core (courses required of ALL students in a program) **48 Credits**

| Rubric/Number | Course Title | SCH |
|---|---|---|
| *General Core: Student must complete all courses (27 credits)* | | |
| BIOL 1120/1121 | General Biology I & Lab | 4 |
| BIOL 2230 | Microbiology | 4 |
| BIOL 4510 | Food and Industrial Microbiology | 4 |
| CHEM 1120/1121 | General Chemistry II & Lab | 4 |
| CHEM 2030/2031 | Elements of Organic Chemistry & Lab | 4 |
| CHEM 3530 | Principles of Biochemistry & Lab | 4 |
| ABAS XXXX | Consumer Motivation & Sensory Evaluation of Fermented Foods | 3 |

| Specialized Core: Student selects 21 hours from courses listed below | | |
|---|---|---|
| ABAS 2010 | World Food and Society | 3 |
| ABAS 2500 | Wine Appreciation | 3 |
| ABAS 3160 | Value Added Agriculture | 3 |
| ABAS 3810 | Milk Processing and Marketing | 3 |
| ABAS 3850 | Wine Science and Industry | 3 |
| ABAS 4500 | Sustainability in Agricultural Ecosystems | 3 |
| ABAS 4820 | Principles of Food Processing | 3 |
| ABAS 4830 | Food Quality Control | 3 |
| ABAS 4850 | Food Safety Issues from Production to Consumer | 3 |
| BIOL 4570/4571 | Principles of Toxicology | 3 |
| LSTS 4140 | Wine Tourism | 3 |
| ABAS XXXX | Legal Issues-Fermentation | 2 |
| ABAS XXXX | Brewing, Distillation and Fermentation (BDF) Safety & Sanitation | 2 |
| ABAS XXXX | Brewing and Distillation Science and Analysis | 2 |
| ABAS XXXX | Facility Operation and Design | 2 |
| ABAS XXXX | Applied Fermentation – Grains and Biofuels | 2 |
| ABAS XXXX | Applied Fermentation– Milk, Meats and Baking Science | 2 |
| ABAS XXXX | Applied Fermentation– Fruits and Vegetables | 2 |

*"ABAS XXXX" indicates courses to be developed and numbered upon approval of applicable campus committees, including the University Curriculum Committee.*

*NOTE: All courses that involve tasting are restricted to Fermentation Science majors with junior standing or above, per State of Tennessee law.*

3. Business Foundations: **12 Credits**

| **Rubric/Number** | **Course Title** | **SCH** |
|---|---|---|
| | *Select 12 credits from courses listed below* | |
| MGMT 3610 | Principles of Management (3 credits) | 3 |
| MKT 3820 | Principles of Marketing (3 credits) | 3 |
| ENTR 2900 | Entrepreneurship (3 credits) | 3 |
| ACTG 3000 | Survey of Accounting for General Business (3 credits) | 3 |
| FIN 3000 | Principles of Financial Management (3 credits) | 3 |
| BLAW 3400 | Legal Environment of Business (3 credits) | 3 |
| MGMT/ENTR 4920 | Small Business Management (3 credits) | 3 |
| BCED 3510 | Business Communications (3 credits) | 3 |

*NOTE: Students may count Business Foundations courses toward the requirements of a minor in Business Administration or Entrepreneurship.*

4. Electives: **12 Credits**

| **Rubric/Number** | **Course Title** | **SCH** |
|---|---|---|
| *Student may select any 12 additional credits to meet 120 hour requirement* | | 12 |

*NOTE: Elective may applied to requirements to earn a minor.*

5. Other credits – Capstone Experience: **6 Credits**

| Rubric/Number | Course Title | SCH |
|---|---|---|
| *Capstone Experience: Select from below* | | *6* |
| ABAS XXXX | Fermentation Science Research Experience (1-3 credits) | |
| ABAS XXXX | Fermentation Science Internship Experience (1-3 credits) | |

6. Number of NEW courses (include newly developed yet never taught courses):
**10** with **19-23** SCH

7. Number of SCH anticipated from transfer, articulation, PLA and other sources per THEC 1.06.0) (specify source): **60**

8. For Universities only: Indicate all Tennessee Transfer Pathways (TTP) acceptable for entry into the proposed program per THEC 1.0.60:

| TTP | Yes | No |
|---|---|---|
| Accounting | | ☐ |
| Agriculture-AGBUS | ☐ | |
| Agriculture-Animal Science | ☐ | |
| Agriculture-Plant and Soil Science | ☐ | |
| Art (Studio) | | ☐ |
| Biology | ☐ | |
| Business Administration | | ☐ |
| Chemistry | ☐ | |
| Civil Engineering | | ☐ |
| Computer Science | | ☐ |
| Criminal Justice | | ☐ |
| Economics-Business | | ☐ |
| Economics-Liberal Arts | | ☐ |
| Electrical Engineering | | ☐ |
| English | | ☐ |
| Exercise Science | ☐ | |
| Foreign Language | | ☐ |
| Geography | | ☐ |
| History | | ☐ |
| Information Systems | ☐ | |
| Kinesiology | ☐ | |
| Mathematics | ☐ | |
| Mass Communication | | ☐ |
| Mechanical Engineering | | ☐ |
| Music | | ☐ |
| Nutrition and Food Science | ☐ | |

| | | |
|---|---|---|
| Physics | | ☐ |
| Political Science | | ☐ |
| Pre-Clinical Laboratory Science | ☐ | |
| Pre-Health (Pre-Dental, Vet, Med, OPT, Pharm) | ☐ | |
| PreK-12 | | ☐ |
| Pre-Nursing | ☐ | |
| Pre-Occupational Therapy | ☐ | |
| Pre-Physical Therapy | ☐ | |
| Psychology | | ☐ |
| Social Work | | ☐ |
| Sociology | | ☐ |
| Speech Communication | | ☐ |
| Theatre Arts | | ☐ |

## SECTION IV: STUDENT ENROLLMENT PROJECTIONS

Estimate the unduplicated annual full-time, part-time and FTE enrollments and number of graduates for the first five years of program operation. Include anticipated international enrollment if used as a primary recruiting tool. If the proposed program involves more than one institution, provide aggregated as well as disaggregated data for all institutions.

Complete a minimum of 3 years projection for certificates and associate degrees, 5 years projection for undergraduate and masters degrees and 7 years for doctoral degrees.

| Year (specify Term & AY start) | Full-Time Headcount | Part-time Headcount | International Headcount Anticipated | Total Year Headcount | FTE | Graduates |
|---|---|---|---|---|---|---|
| 1 | 10 | 2 | 0 | 12 | 11 | - |
| 2 | 20 | 4 | 0 | 24 | 22 | - |
| 3 | 29 | 6 | 0 | 35 | 32 | 1 |
| 4 | 39 | 10 | 0 | 49 | 44 | 7 |
| 5 | 48 | 10 | 0 | 58 | 53 | 11 |

A. Explain the basic assumptions including attrition rate used in estimating the size of the proposed program by benchmark against other comparable programs in the discipline and institution to establish a baseline for your projected enrollments. Assumptions should be related to the evidence of need and to other supportive data.

The enrollment estimates in the table above are based on a projected 20% attrition rate, which is comparable to that experienced in the College of Basic and Applied overall. The explosive growth of the fermented foods and fermentation-derived energy industries in Tennessee over the last 20 years in addition to the MBAA 2014 Higher Education Survey results (previously discussed) indicate significant interest in and potential for employment of graduates with the proposed degree. We estimate that up to one percent of the students pursuing Biology, Chemistry or Agribusiness and Agriscience degrees at MTSU each year (1756 in spring, 2016) will chose to major in Fermentation Science in addition to an equal percentage of students transferring into these programs at MTSU from all sources (196 in fall, 2015).

The fermented foods industries in surrounding states have also experienced dramatic growth. The craft brewing industry in North Carolina, for example, has grown from a mere handful n 2001 to 150 in 2015, employing an estimated100,000 people.[10] North Carolinians are also taking up food fermentation, both at home and commercially.[11] The North Carolina Distillers Association boasts 29 members currently (http://ncdistillersassociation.org). Virginia now hosts 13 distilleries and 228 wineries and breweries (http://www.virginia.org/directory/wineriesandbreweries/). With the exception of Arkansas, every surrounding state is also actively involved in ethanol production.

B. Describe the recruitment plan for both domestic and international enrollment if anticipated. Please note: Programs may not be advertised prior to final approval through the THEC commission meeting per the THEC Policy 1.0.60.B.

Domestic recruitment will be the focus of the effort in support of this program. MTSU's Admissions and Recruiting Offices will be actively engaged in recruiting for this as well as all other majors on the MTSU campus. Program information and recruitment materials will be distributed to high school counselors throughout the State of Tennessee to facilitate high school senior recruitment and the major will be highlighted by Basic and Applied College advisors when they travel in support of MTSU recruitment drives across the state.

Perhaps most importantly will be our recruitment effort through the Academic Common Market. At present there is no similar program offered at any state participating within the Academic Common Market, making this program at MTSU highly marketable to a wide geographic range and significantly large number of high school and college students. North Carolina, the only state adjacent to Tennessee that offers a similar degree at a state supported institution of higher education (Appalachian State University), does

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[10] N.C. craft beer industry now tops in the South, Kathleen Purvis, The Charlotte Observer, Aug 8, 2015, http://www.charlotteobserver.com/living/food-drink/article30505149.html, extracted from the internet 8 Feb 16.

[11] Fermentation takes off in Triangle home kitchens, Andrea Weigl, The News & Observer, Oct 14, 2014, http://www.newsobserver.com/living/food-drink/article10096025.html, extracted from the internet 8 Feb 16.

not participate in the Academic Common Market. It is therefore possible that MTSU will attract students who would otherwise attend Appalachian State University.

## SECTION V: RESOURCES

A. Provide the most recent accreditation report/audits for any existing offerings within the same division/department/college which speaks to need or resource allocations.

MTSU has just completed our 10 year reaffirmation visit by SACSCOC and have been informed that no recommendations will be made to the SACSCOC Board at its December 2016 meeting. There are no recent program reviews or disciplinary accreditation reviews that have pointed to a need for additional resources. The College recently moved into a new Science building with all new laboratories and classrooms.

B. List any requirement for needed resources support along with any industry contributions

MTSU already possesses significant equipment for specialized instruction in fermenation and wine production, however additional, specialized equipment such as fermentation tanks, analytical equipment, and laboratory space will need to be purchased, installed and/or prepared. One-time expenditures for this additional equipment is budgeted in years 1 and 2 of the degree program. As the university reduces its focus on alternative fuels, space will be available for laboratories dedicated to the Fermentation Science program. One-time expenditures to retrofit the space is included in years 1 and 2 of the degree. A number of persons in the fermentation and distillation industry across the state have already indicated their interest and willingness to provide support in the form of internships and sharing of specific expertise. We anticipate forming partnerships with individuals and corporations once the program in implemented.

C. Cite the THEC annual degree productivity data where funds may be redirected from closed low-producing programs (THEC A1:1.2OP) of relevant.

No funds are being redirected from closed low-producing programs.

D. Faculty: Describe the strengths of the existing faculty in credentials and available FTE (state number of full- and part-time faculty). Estimate additional FTE (specify number of full-time and part-time faculty) needed to support the program. If faculty are drawn from multiple departments or are committed to teach in multiple programs, identify which faculty and the percentage of their time dedicated to each program.

The School of Agribusiness and Agriscience at MTSU currently has a faculty member who holds a doctorate in Enology and Viticulture and has worked extensively in the fermented foods industry. To start the degree program, in year one we will add an additional full-time doctorally-prepared Fermentation Science professor to teach the new Agribusiness and Agriscience courses described in this proposal. This individual will

have educational and experiential credentials to teach and research in the area of fermented milk, meat and baked products. We will employ a second full-time, doctorally-prepared faculty member with educational and experiential credentials to teach and research in Brewing and distillation science in year 2 as the curriculum expands and additional courses / sections are offered.

The Biology and Chemistry courses required for this degree are taught by faculty members currently on staff (see Attachment B for a summary of faculty qualifications). Since no new Biology or Chemistry classes will be created for this degree and the additional students taking existing courses will not require the creation of additional sections, no additional faculty in these departments will be required.

The Department of Human Sciences was consulted during the development of this Letter of Application. The School of Agribusiness and Agriscience currently collaborates with the Department of Human Sciences in several programs with Dr. Johnston teaching several of the required food technology courses for students majoring in Nutrition and Food Science. The department is aware of the proposed degree and supports its implementation, however the department is not currently staffed to teach courses in Fermentation Science. Moving forward, they are interested in collaboration and potentially advising students to consider the degree as an alternative to their Nutrition major.

E. Administrative/organizational structure and personnel

Current administrative staffing is adequate to handle the new program.

F. Clerical and Support Personnel, available and needed

In addition to the existing and projected faculty resources to support this degree, we also budget for a full-time technician to maintain the equipment and related technology of this program in year 4 as enrollment grows and faculty members assume increased instructional duties.

G. Describe existing library and information technology resources to be available to support the projected program.

While print materials, subscriptions, and academic databases are available that relate to the proposed new program of study at the library, students will also be working with the latest hardware and software, and much of this information is primarily available from the manufacturers. Advanced classes will likely rely, to a large degree, on manufacturers' literature for specifications and performance data. To ensure that necessary resources continue to be available through the library, we have budgeted for a recurring increase in the budget (see Attachment A).

H. Describe Student Advisement Support. If the proposed program is part of a collaboration or articulation agreement, how will student advising be coordinated by all participating institutions to facilitate progression and completion across all participating institutions.

The College of Basic and Applied Sciences provides 16 full-time advisors for students in the college, and the university also has trained advisors specifically for transfer students within the Student Advising Center. Additionally, faculty will also advise all Fermentation Science students on both curricular and career issues. The School of Agribusiness and Agriscience also maintains a robust and active advisory board (see Attachment D for current membership), which will provide additional mentoring and experiential opportunities for our students.

I. Describe existing and anticipated instructional facilities & instructional equipment to support the proposed program.

The School of Agribusiness and Agriscience currently has adequate classroom space and floor space for a fermentation laboratory but the fermentation laboratory will require the installation of floor drains and certain other modifications to render them acceptable for the production of food products. Specialized instructional equipment will need to be purchased, since only limited types of fermentation are currently taught at MTSU. Funds have been budgeted for facility renovation and equipment purchase (see Attachment A).

## SECTION VI: FINANCIAL PROJECTIONS

A. Use the THEC Financial Projections Form (FP) to provide revenues and expenditures for the proposed program. If the proposed program involved more than one institution, provide a separate excel FP Form for each institution as well as an aggregate for the combined financial projections. **Submit as an Appendix the THEC Financial Projection Form.**

The THEC Financial Projections Page is provided as Attachment A.

B. If reallocation is used, provide a rationale and source for reallocation of budgeted funds. Cite THEC annual degree productivity data where funds may be redirected from closed/ low producing programs (A1:1.2OP), if relevant.

The College of Basic and Applied Sciences is reducing its focus on alternative fuels programs and resources previously allocated to this program will be reassigned to the Fermentation Science program.

C. List for each institution involved:

1. All active Letters of Application

   B.S. / B.A. in Religious Studies

2. Approved programs not meeting benchmarks

- M.S. in Horse Science (meeting graduation benchmark)
- M.A. in International Affairs (meeting graduation benchmarks)
- M.S. in Management (exceeding enrollment benchmark)
- Ed.D. in Assessment, Learning, and School improvement

3. Low producing programs at all levels

- B.S. in Environmental Science & Technology (substantive revision in 2015)
- B.A. in Art History (substantive revision in 2016)
- B.S. in Athletic Training
- B.S. in Forensic Science
- M.S.T. in Mathematics
- Ph.D. in Public History

4. Programs terminated within the last 12 months

- Office Management (B.B.A.)
- Speech & Theatre (B.A.)
- Environmental health & Safety (concentration)
- Energy Technology (concentration)
- Elementary Education (concentration within Ed.S.)

## ATTACHMENTS AND APPEDIXES

Attachment A: THEC Financial Estimate Form

Attachment B: Sample Program of Study (Full-time and Part-time)

Attachment C: Summary of Faculty Qualifications

Attachment D: School of Agribusiness and Agriscience Advisory Board

Appendix I: Course Descriptions

Appendix II: Organizational Chart

Appendix III: Letters of Support

**Tennessee Higher Education Commission**
**Attachment A: THEC Financial Projections**
**Middle Tennessee State University**
**B.S. in Fermentation Science**

Seven-year projections are required for doctoral programs.
Five-year projections are required for baccalaureate and Master's degree programs
Three-year projections are required for associate degrees and undergraduate certificates.
Projections should include cost of living increases per year.

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 |
|---|---|---|---|---|---|---|---|
| **I. Expenditures** | | | | | | | |
| | | | | | | | |
| **A. One-time Expenditures** | | | | | | | |
| New/Renovated Space | $ 75,000 | $ 75,000 | $ - | $ - | $ - | $ - | $ - |
| Equipment | 25,000 | 30,000 | - | - | - | - | - |
| Library | - | | - | - | - | - | - |
| Consultants | - | - | - | - | - | - | - |
| Travel | | - | - | - | - | - | - |
| Other | - | - | - | - | - | - | - |
| **Sub-Total One-time** | $ 100,000 | $ 105,000 | $ - | $ - | $ - | $ - | $ - |
| | | | | | | | |
| **B. Recurring Expenditures** | | | | | | | |
| **Personnel** | | | | | | | |
| **Administration** | | | | | | | |
| Salary | $ 9,200 | $ 9,200 | $ 9,200 | $ 9,200 | $ 9,200 | $ - | $ - |
| Benefits | - | - | - | - | - | - | - |
| **Sub-Total Administration** | $ 9,200.00 | $ 9,200.00 | $ 9,200.00 | $ 9,200.00 | $ 9,200.00 | $ - | $ - |
| | | | | | | | |
| **Faculty** | | | | | | | |
| Salary | $ 65,000 | $ 133,900 | $ 137,917 | $ 142,055 | $ 146,316 | $ - | $ - |
| Benefits | 22,750 | 46,865 | 48,271 | 49,719 | 51,211 | - | - |
| **Sub-Total Faculty** | $ 87,750 | $ 180,765 | $ 186,188 | $ 191,774 | $ 197,527 | $ - | $ - |
| | | | | | | | |
| **Support Staff** | | | | | | | |
| Salary | $ - | $ - | $ - | $ 45,000 | $ 46,350 | $ - | $ - |
| Benefits | - | - | - | 15,750 | 16,223 | - | - |
| **Sub-Total Support Staff** | $ - | $ - | $ - | $ 60,750 | $ 62,573 | $ - | $ - |
| | | | | | | | |
| **Graduate Assistants** | | | | | | | |
| Salary | $ - | $ - | $ - | $ - | $ - | $ - | $ - |
| Benefits | - | - | - | - | - | - | - |
| Tuition and Fees* (See Below) | - | - | - | - | - | - | - |
| **Sub-Total Graduate Assistants** | $ - | $ - | $ - | $ - | $ - | $ - | $ - |
| | | | | | | | |
| **Operating** | | | | | | | |
| Travel | $ 10,000 | $ 7,000 | $ 5,000 | $ 4,000 | $ 4,000 | $ - | $ - |
| Printing | - | - | - | - | - | - | - |
| Equipment | - | - | - | - | - | - | - |
| Other | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | - | - |
| **Sub-Total Operating** | $ 15,000 | $ 12,000 | $ 10,000 | $ 9,000 | $ 9,000 | $ - | $ - |
| | | | | | | | |
| **Total Recurring** | **$ 111,950** | **$ 201,965** | **$ 205,388** | **$ 270,724** | **$ 278,300** | $ - | $ - |
| | | | | | | | |
| **TOTAL EXPENDITURES (A + B)** | **$ 211,950** | **$ 306,965** | **$ 205,388** | **$ 270,724** | **$ 278,300** | $ - | $ - |

*If tuition and fees for Graduate Assistants are included, please provide the following information.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Base Tuition and Fees Rate | $ - | $ - | $ - | $ - | $ - | $ - | $ - |
| Number of Graduate Assistants | - | - | - | - | - | - | - |

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 |
|---|---|---|---|---|---|---|---|
| **II. Revenue** | | | | | | | |
| Tuition and Fees[1] | 88,968 | 183,216 | 274,176 | 388,608 | 473,180 | - | - |
| Institutional Reallocations[2] | 122,982 | 123,749 | (68,788) | (117,884) | (194,880) | - | - |
| Federal Grants[3] | - | - | - | - | - | - | - |
| Private Grants or Gifts[4] | - | - | - | - | - | - | - |
| Other[5] | - | - | - | - | - | - | - |
| **BALANCED BUDGET LINE** | **$ 211,950** | **$ 306,965** | **$ 205,388** | **$ 270,724** | **$ 278,300** | **$ -** | **$ -** |

**Notes:**

**(1) In what year is tuition and fee revenue expected to be generated and explain any differential fees. Tuition and fees include maintenance fees, out-of-state tuition, and any applicable earmarked fees for the program.**

YEAR 1: (10 FT x 12 sch x 2 sem. X $337 = $80,880) + (2 x 6 sch x 2 sem. X $337 = $8,088) = $88,968
YEAR 2: (20 FT x 12 sch x 2 sem. X $347 = $166,560) + (4 x 6 sch x 2 sem. X $347 = $16,656) = $183,216
YEAR 3: (29 FT x 12 sch x 2 sem. X $357 = $248,472) + (6 x 6 sch x 2 sem. X $357 = $25,704) = $274,176
YEAR 4: (39 FT x 12 sch x 2 sem. X $368 = $344,448) + (10 x 6 sch x 2 sem. X $368 = $44,160) = $388,608
YEAR 5: (48 FT x 12 sch x 2 sem. X $372 = $428,544) + (10 x 6 sch x 2 sem. X $372 = $44,640) = $473,180

**(2) Please identify the source(s) of the institutional reallocations, and grant matching requirements if applicable.**

The university is reducing the scope of it's alternative fuels programs and will reallocate laboratory space and resources to this program.
Funds from the Technology Access Fee (TAF) are available to support the one-time capital expenses to obtain equipment and instructional space & techonology.

**(3) Please provide the source(s) of the Federal Grant including the granting department and CFDA(Catalog of Federal Domestic Assistance) number.**

**(4) Please provide the name of the organization(s) or individual(s) providing grant(s) or gift(s).**

**(5) Please provide information regarding other sources of the funding.**

NOTE: One-Time Expenses includes $75.000 in years 1 & 2 for renovation of specialized laboratory facilities
One-Time Expenses includes $25,000 (year 1) & $35,000 (year2) for specialized equipment.
Recurring Expenditures includes $9,200 per year to pay for one-course reassignment and summer stipend for program coordinator.
Recurring Expenditures includes funds to support one additional faculty member in year one with the addition of a second faculty member in year 2.
Recurring Expenditures includes funds to support the employment of a technician in year 4 of the program
Recurring Expenditures includes funds to support travel each year as well as a $5,000 increase in the Library budget to support the program.